BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

WHAT IS CLAIMED IS:

1. A manufacturing method of an alkaline solution, comprising: dissolving a gaseous molecule having oxidizing properties or reducing properties in an aqueous alkaline solution.

2. The manufacturing method of the alkaline solution according to claim 1, further comprising: dissolving at least one of oxygen, ozone, carbon monoxide, and hydrogen peroxide as the gaseous molecule having said oxidizing properties in said aqueous alkaline solution.

3. The manufacturing method of the alkaline solution according to claim 1, further comprising: dissolving at least one of hydrogen, H_2S, HNO_3, and H_2SO_3 as the gaseous molecule having said reducing properties in said aqueous alkaline solution.

4. The manufacturing method of the alkaline solution according to claim 1, wherein an alkali concentration of said alkaline solution is not less than 1% and less than 4%.

5. A manufacturing method of an alkaline solution, comprising: mixing a solution in which a gaseous molecule having oxidizing properties or reducing properties is dissolved in pure water with an aqueous alkaline solution.

6. The manufacturing method of the alkaline solution according to claim 5, further comprising:

dissolving at least one of oxygen, ozone, carbon monoxide, and hydrogen peroxide as the gaseous molecule having said oxidizing properties in said pure water.

7. The manufacturing method of the alkaline solution according to claim 5, further comprising: dissolving at least one of hydrogen, H_2S, HNO_3, and H_2SO_3 as the gaseous molecule having said reducing properties in said pure water.

8. The manufacturing method of the alkaline solution according to claim 5, wherein an alkali concentration of said alkaline solution is not less than 1% and not more than a saturated concentration.

9. An alkaline solution which is manufactured using the manufacturing method of the alkaline solution according to claim 1 or 5.

10. A pattern forming method comprising:

coating a substrate with a photosensitive resist film;

exposing said photosensitive resist film;

supplying a developing solution in which a gaseous molecule having oxidizing properties or reducing properties is dissolved to said photosensitive resist film, and developing the resist film; and

supplying a cleaning solution to the surface of said substrate, and cleaning the substrate.

11. The pattern forming method according to claim 10, further comprising: discharging the

developing solution to said photosensitive resist film from a developing solution supply nozzle; relatively moving said substrate and said developing solution supply nozzle; forming a developing solution film on the surface of the resist film; and developing said photosensitive resist film.

12. The pattern forming method according to claim 11, further comprising: fluidizing the developing solution film on said photosensitive resist film after said developing solution film is formed.

13. The pattern forming method according to claim 10, further comprising: supplying an oxidizing solution or a reducing solution as said cleaning solution to said substrate surface.

14. A removing method of a resist film, comprising:

supplying an alkaline removing solution with a gaseous molecule having oxidizing properties or reducing properties dissolved therein onto a substrate in which a pattern of a photosensitive resist film formed on a surface is used as a mask to perform an etching treatment, and removing the resist film; and

supplying a cleaning solution onto said substrate, and cleaning the substrate.

15. A solution application apparatus comprising:

a substrate holding base which holds a substrate;

a gas dissolution mechanism including either one

of a mechanism in which an oxidizing gas is dissolved in an alkaline solution and a mechanism in which a reducing gas is dissolved in the alkaline solution;

an alkaline solution supply nozzle which supplies the alkaline solution in which a gaseous molecule having oxidizing properties or reducing properties is dissolved by the gas dissolution mechanism onto the substrate ; and

a cleaning solution supply nozzle which supplies a cleaning solution onto said substrate.

16. A substrate treatment method comprising:

coating a substrate with a photosensitive resist film;

exposing said photosensitive resist film;

supplying a reducing solution the surface of said exposed photosensitive resist film and performing a pretreatment;

developing the photosensitive resist film subjected to said pretreatment; and

supplying a cleaning solution to said substrate, and cleaning the substrate.

17. The substrate treatment method according to claim 16, wherein the reducing solution is an aqueous solution containing at least one of hydrogen, H_2S, HNO_3, and H_2SO_3.

18. The substrate treatment method according to claim 16, further comprising: discharging the

developing solution to said photosensitive resist film from a developing solution supply nozzle; relatively moving said substrate and said developing solution supply nozzle; forming a developing solution film on the surface of the photosensitive resist film; and developing said photosensitive resist film.

19. The substrate treatment method according to claim 18, further comprising: agitating said developing solution film; and developing said photosensitive resist film.

20. The substrate treatment method according to claim 16, further comprising: removing said reducing solution from the surface of said photosensitive resist film after said pretreatment; drying the surface of the resist film; and developing said photosensitive resist film.

21. The substrate treatment method according to claim 18, further comprising: forming said developing solution film on the resist film surface in a state in which said reducing solution remains on the surface of said photosensitive resist film after said pretreatment; agitating the remaining solution and the developing solution; and developing said photosensitive resist film.

22. A substrate treatment method comprising:

coating a substrate with a photosensitive resist film;

exposing said photosensitive resist film;

supplying a developing solution to said photosensitive resist film, and forming a developing solution film;

supplying a functional solution having oxidizing properties or reducing properties onto the substrate with said developing solution film formed thereon, and subsequently fluidizing the functional solution and said developing solution film; and

supplying a cleaning solution to the surface of said substrate, and cleaning the substrate.

23. The substrate treatment method according to claim 22, further comprising: supplying the cleaning solution having the oxidizing properties or the reducing properties as said cleaning solution to said substrate surface.

24. The substrate treatment method according to claim 22, further comprising: using an aqueous solution containing at least one of ozone, oxygen, carbon monoxide, and hydrogen peroxide as the functional solution having said oxidizing properties.

25. The substrate treatment method according to claim 22, further comprising: using an aqueous solution containing at least one of hydrogen, H_2S, HNO_3, and H_2SO_3 as the functional solution having said reducing properties.

26. The substrate treatment method according to

claim 22, further comprising:

discharging the developing solution to said photosensitive resist film from a developing solution supply nozzle;

relatively moving said substrate and said developing solution supply nozzle; and

forming said developing solution film on the surface of said photosensitive resist film.

27. The substrate treatment method according to claim 22, further comprising:

discharging said functional solution to said photosensitive resist film from a functional solution supply nozzle;

relatively moving said substrate and said functional solution supply nozzle; and

forming a functional solution film on the surface of said photosensitive resist film.

28. A solution supplying method of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying a solution onto the substrate via the solution supply nozzle to form a solution film on the substrate, said method comprising:

controlling at least one of a supply amount of a solution from the solution supply nozzle and a scanning speed of said solution supply nozzle so that a film thickness d of the solution film formed on said substrate is equal to a gap H between said solution

supply nozzle and the substrate.

29. A solution supplying method of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying a solution onto the substrate via the solution supply nozzle to form a solution film on the substrate, said method comprising:

setting a gap H (mm) between said solution supply nozzle and the substrate to a value obtained by dividing a solution supply speed Q (μl/sec) from said solution supply nozzle by a product of a scanning speed V (mm/sec) of said solution supply nozzle and a length L (mm) of a discharge port of said solution supply nozzle.

30. A solution supplying method of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying a solution onto the substrate via the solution supply nozzle to form a solution film on the substrate, said method comprising:

setting a solution supply speed Q (μl/sec) to a product of a gap H (mm) between said solution supply nozzle and the substrate, a scanning speed V (mm/sec) of said solution supply nozzle, and a length L (mm) of a discharge port of said solution supply nozzle.

31. The solution supplying method according to claim 30, further comprising: increasing said solution supply speed Q (μl/sec) with the scanning of said solution supply nozzle, when a change of a length l of

the substrate of a portion with said solution supplied thereto tends to increase; and lowering said solution supply speed Q (μl/sec) with the scanning of said solution supply nozzle, when the change of said length l tends to decrease.

32. The solution supplying method according to claim 31, further comprising: controlling the solution supply speed Q (μl/sec) in a position x (mm) of said solution supply nozzle the center of a substrate to a value corresponding to a product of a solution supply speed Q_0 (μl/sec) of a time at which said solution supply nozzle is positioned in the substrate middle, and a change amount (dl/l) of a length l (mm) of the substrate of a portion with said solution supplied thereto of a time at which said solution supply nozzle moves on the substrate by a unit distance (dx).

33. A solution supplying method of scanning a linear solution supply nozzle from one end to the other end of a substrate and forming a solution film on the substrate, said method comprising:

setting a scanning speed V (mm/sec) of said solution supply nozzle to a value corresponding to a value obtained by dividing a solution supply speed Q (μl/sec) from said solution supply nozzle by a product of a gap H (mm) between a supply position of said solution supply nozzle and the substrate and a length L (mm) of a discharge port of said solution

supply nozzle.

34. The solution supplying method according to claim 33, further comprising: lowering said scanning speed with the scanning of said solution supply nozzle when a change of a length l of the substrate of a portion with said solution supplied thereto tends to increase, and increasing said scanning speed with the scanning of said solution supply nozzle, when the change of said length l tends to decrease.

35. The solution supplying method according to claim 34, further comprising: correcting the nozzle scanning speed V (mm/sec) in a position x (mm) of said solution supply nozzle from a substrate middle in accordance with a value of a product of a scanning speed V_0 (mm/sec) of a time at which said solution supply nozzle is positioned in the center of a substrate, and a change amount (dl/l) of a length l (mm) of the substrate of a portion with said solution supplied thereto of a time at which said solution supply nozzle moves on said substrate by a unit distance (dx).

36. A manufacturing method of a semiconductor device, comprising:

coating a substrate with a photosensitive resist film;

exposing said photosensitive resist film;

supplying a developing solution with a gaseous

molecule having oxidizing properties or reducing properties dissolved therein to said photosensitive resist film, and developing the resist film; and

supplying a cleaning solution to the surface of said substrate, and cleaning the substrate.

37. A manufacturing method of a semiconductor device, comprising:

supplying an alkaline removing solution with a gaseous molecule having oxidizing properties or reducing properties dissolved therein onto a substrate in which a pattern of a photosensitive resist film formed on a surface is used as a mask to perform an etching treatment, and removing the resist film; and

supplying a cleaning solution onto said substrate, and cleaning the substrate.

38. A manufacturing method of a semiconductor device, comprising:

coating a substrate with a photosensitive resist film;

exposing said photosensitive resist film;

supplying a reducing solution the surface of said exposed photosensitive resist film and performing a pretreatment;

developing the photosensitive resist film subjected to said pretreatment; and

supplying a cleaning solution onto said substrate, and cleaning the substrate.

39. A manufacturing method of a semiconductor device, comprising:

coating a substrate with a photosensitive resist film;

exposing said photosensitive resist film;

supplying a developing solution to said photosensitive resist film, and forming a developing solution film;

supplying a functional solution having oxidizing properties or reducing properties onto the substrate with said solution film formed thereon, and subsequently fluidizing the functional solution and said developing solution film; and

supplying a cleaning solution to the surface of said substrate, and cleaning the substrate.

40. A manufacturing method of a semiconductor device of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying a solution onto the substrate via the solution supply nozzle to form a solution film on the substrate, said method comprising:

controlling at least one of a supply amount of a solution from the solution supply nozzle and a scanning speed of said solution supply nozzle so that a film thickness d of the solution film formed on said substrate is equal to a gap H between said solution supply nozzle and the substrate.

41. A manufacturing method of a semiconductor device of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying a solution onto the substrate via the solution supply nozzle to form a solution film on the substrate, said method comprising:

setting a gap H (mm) between said solution supply nozzle and the substrate to a value obtained by dividing a solution supply speed Q (μl/sec) from said solution supply nozzle by a product of a scanning speed V (mm/sec) of said solution supply nozzle and a length L (mm) of a discharge port of said solution supply nozzle.

42. A manufacturing method of a semiconductor device of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying a solution onto the substrate via the solution supply nozzle to form a solution film on the substrate, said method comprising:

setting a solution supply speed Q (μl/sec) to a product of a gap H (mm) between said solution supply nozzle and the substrate, a scanning speed V (mm/sec) of said solution supply nozzle, and a length L (mm) of a discharge port of said solution supply nozzle.

43. A manufacturing method of a semiconductor device of scanning a linear solution supply nozzle from one end to the other end of a substrate, and supplying

a solution onto the substrate from the solution supply nozzle to form a solution film on the substrate, said method comprising:

setting a scanning speed V (mm/sec) of said solution supply nozzle to a value corresponding to a value obtained by dividing a solution supply speed Q (μl/sec) from said solution supply nozzle by a product of a gap H (mm) between a supply position of said solution supply nozzle and the substrate and a length L (mm) of a discharge port of said solution supply nozzle.